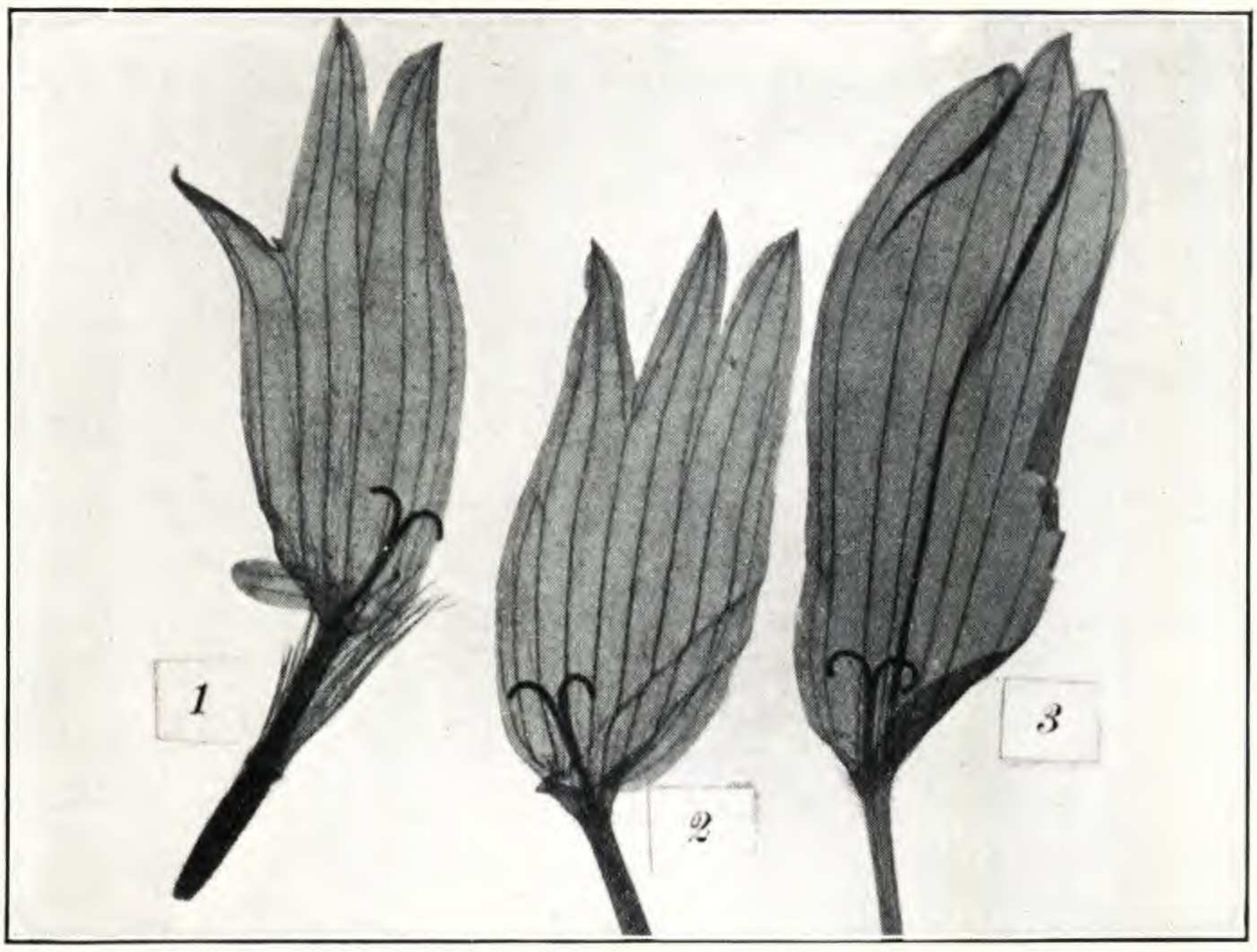

Ligules, × 2, of ARNICA ALPINA (FIGS. 1 and 2); of var. ANGUSTIFOLIA (FIG. 3).

EXPLANATION OF PLATES 279 AND 280

PLATE 279. TYPE of RANUNCULUS PEDATIFIDUS J. E. Sm., from Siberia, coll. *Gmelin*, in Linnean Herb. (Photograph, × 1, presented by Dr. *H. K. Svenson*, through Mr. *R. G. Pugsley* of the Linnean Society of London).

PLATE 280. FIG. 1, RANUNCULUS PEDATIFIDUS from Mt. Sinjuck in the Altai, Siberia, May 22, 1901, *Krylov;* FIG. 2, from Elbow River, Alberta, *J. Macoun*, no. 18,035; FIG. 3, R. PEDATIFIDUS, var. LEIOCARPUS (Trautv.) Fern., from Disko, Greenland, July 1, 1929, *R. T. Porsild;* FIG. 4, from Melville Island, 1820, *John Edwards*, ISOTYPE of *R. affinis* R. Br. Photograph by Dr. *L. B. Smith*, all specimens × 1.

HAMAMELIS VIRGINIANA IN MISSOURI

JULIAN A. STEYERMARK

IN 1911 Sargent described[1] under the name *Hamamelis vernalis* a new species based upon material from Missouri, northern Arkansas, and eastern Oklahoma. This new species was distinguished from the eastern *H. virginiana* with which it had been confused by the following characteristics, namely, (1) the period of anthesis occurred be-

[1] Sargent, C. S. Trees and Shrubs. **2**: 137. 1911.

tween the last of January and the first of April instead of late autumn and early winter, (2) the inner surface of the calyx-lobes was suffused with reddish, whereas in *H. virginiana* it was entirely greenish or yellowish-green, (3) the youngest branchlets were densely stellate-tomentose, whereas they were less pubescent to finally glabrate or nearly so in *H. virginiana*, (4) the plants spread vegetatively by an extensive underground shoot system which resulted in thickets, and (5) the habitat was gravelly beds of streams or rocky bars along creeks instead of upland areas and wooded slopes. Moreover, in *H. vernalis* the bases of the leaf-blades tended towards subcuneate.

In Missouri *H. vernalis* has hitherto been the only species known to the state, and is found only in the Ozark Region in the southern portion of the state, chiefly in the Iron Mountain and St. Francois Hills section of southeastern Missouri, and along the White River and tributaries in the southwestern part of the state. Its range extends north in the Ozark region to Pulaski and Jefferson counties.

In the early part of November, 1930, the writer visited the so-called "Royal Gorge" in Iron Co., in the southeastern Ozark region of Missouri. This "gorge" is one of many similar canyons in the granitic and porphyritic trachyte region which has been chiselled by stream erosion. In the narrow bouldery stream-bed grew thickets of fruiting *Hamamelis vernalis* with its characteristic bushy habit of growth; but on the lower rocky wooded slopes of the canyon above the stream-bed occurred numerous plants of another *Hamamelis* in full bloom! This was quite unusual, since the Ozark Witch Hazel, *H. vernalis*, blooms from January to April and grows in rocky stream-beds and along gravel bars; but none of the plants of *H. vernalis* in the stream-bed were in bloom, nor showed any signs of coming into bloom for a long time. An examination of the young branchlets of the season of the flowering plants growing on the wooded slopes revealed that their twigs were slightly pubescent to glabrate; also there was no reddish coloring on the inner surface of the calyx-lobes. Such evidence seemed to point to the fact that these late-flowering plants were *H. virginiana* rather than *H. vernalis*.

Not until the latter part of February, 1933, did the writer have an opportunity to re-visit this interesting locality. Then the situation was exactly the reverse to that of the previous visit. All the plants occurring in the rocky stream-bed were in full flower, and showed all the distinguishing traits of *H. vernalis*. On the other hand, none of

the plants growing on the wooded slopes above the stream-bed were in flower. That they had already blossomed two or more months previously was shown by the fact that the petals had mostly fallen from the calyx, and in a few cases in which they were still attached they were mainly dried and brown. Moreover, the *Hamamelis* of the wooded slopes all showed the youngest branchlets to be slightly pubescent or glabrate, whereas those of the plants in the rocky stream-bed were densely tomentose.

A comparison of material of the autumn-flowering *Hamamelis* from "Royal Gorge" with herbarium specimens of the eastern *H. virginiana* in the Missouri Botanical Garden Herbarium as well as with living plants of this species growing in the Missouri Botanical Garden likewise served to identify these plants with *H. virginiana*. At this season of the year, i. e., late February, the ovary of the autumn-flowering plants at "Royal Gorge" was very small, and was practically no more developed than in anthesis. This fact was also borne out upon comparison of the ovaries with the living plants of *H. virginiana* in the Missouri Botanical Garden. The appearance of the inner surface of the calyx was likewise similar in both.

The same locality was studied during the first week in November, 1933, and the situation was exactly as expected, that is, the *Hamamelis vernalis* of the rocky stream-bed was in the dormant winter-bud stage, and showed no signs of blooming for some months, whereas the *H. virginiana* of the rocky slopes and ground above and along the stream course was in full bloom with lemon-yellow petals and the inner surface of the calyx-lobes greenish or yellowish-green.

With this evidence at hand it was expected that with careful search *Hamamelis virginiana* might be found in some of the surrounding counties of the state where granitic or porphyritic trachyte canyons abound. Accordingly, a trip was made the following week in November to adjacent Reynolds county. Along the East Fork of the Black River in southern Iron Co. and again in Reynolds Co. were many plants of *H. virginiana* in full bloom on the lower slopes of the hills and in the wooded valleys. It was interesting to note that where both *H. vernalis* and *H. virginiana* occurred in the same region there was a slight overlap in habitat, the former extending to the outer margin of the gravel bars and rocky stream-beds and the latter close to the rocky portion of the stream bar. However, the former kept to the rockiest portions of the stream bar and never occurred on the adjacent

wooded slopes, whereas the latter was common on the rocky wooded slopes, and while descending to the wooded valley to the edges of the rocky stream-bed did not take to the rockiest portion of the bar as did *H. vernalis*. Although these two species may occur side by side in Missouri, there is no opportunity for natural crossing to occur, since the time of anthesis is quite different. Also the distinctive morphological characters for each species have been maintained throughout.

There can be no doubt, then, that both species of *Hamamelis*, i. e., *H. vernalis* and *H. virginiana*, occur in Missouri. It is not surprising to find *H. virginiana* in eastern Missouri, and especially in the southeastern Ozark region, inasmuch as quite a number of eastern species are known in Missouri only from this southeastern area, such as *Pedicularis lanceolata*, *Goodyera pubescens*, *Lycopodium complanatum* var. *flabelliforme*, *Dennstaedtia punctilobula*, *Thelypteris spinulosa* var. *intermedia*, *Asplenium pinnatifidum*, *Ilex verticillata* var. *padifolia*, *Rhododendron roseum*, *Viola pallens*, *Frasera caroliniensis*, *Phlox maculata*, and many others. Moreover, quite a few of these eastern species in the southeastern Ozark region are known only from the Iron Mountain section, such as *Ilex verticillata* var. *padifolia*, *Pedicularis lanceolata*, and *Phlox maculata*. Associated with the *Hamamelis virginiana* on the wooded slopes at "Royal Gorge" were such eastern species as *Quercus coccinea*, *Acer saccharum* var. *glaucum*, *Acer rubrum*, *Ostrya virginica*, *Vaccinium arboreum* var. *glaucescens* and along the stream-bed *Ilex verticillata* var. *padifolia*, *Alnus rugosa*, and *Gentiana quinquefolia*. At the time of the influx or migration of many of these eastern species into the southeastern Ozark region *Hamamelis virginiana* probably appeared along with its associates, *Quercus coccinea*, *Acer rubrum*, *Acer saccharum* var. *glaucum*, *Ostrya virginica*, *Ilex verticillata* var. *padifolia*, and a number of others. This eastern invasion into southeastern Missouri may have occurred near the close of the Tertiary following the last uplift of the Ozark region, or it may have taken place following one of the retreats or advances of one of the Pleistocene ice-movements. The appearance of *Hamamelis virginiana* in this section of southeastern Missouri is therefore in accordance with the occurrence of a number of other eastern species which reach the Ozark region in limited distribution.

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